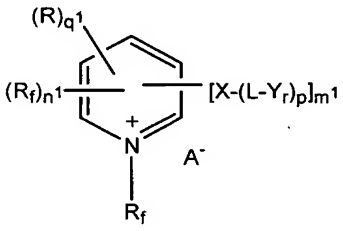
WHAT IS CLAIMED IS:

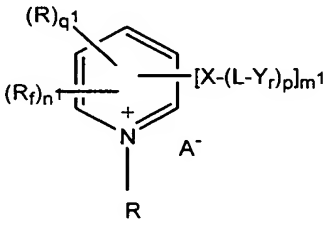
1. A method for improving the particle size and size distribution of electrophoretic microparticles and the performance of an electrophoretic display, which method comprises adding a fluorinated quaternary nitrogen salt into the precursor/internal phase of a process for the formation of the electrophoretic microparticles.

2. The method of Claim 1 wherein said fluorinated quaternary nitrogen salt is a fluorinated pyridinium, quinolinium, ammonium, acridinium, azolium or a fused ring derivative thereof.

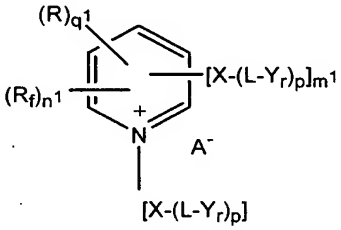
3. The method of Claim 2 wherein said fluorinated quaternary nitrogen salt is represented by the following formulas:



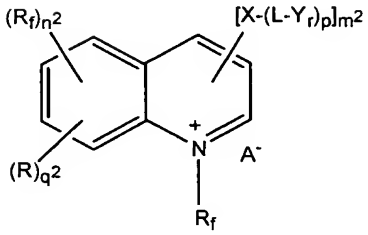
Structure (P-1)



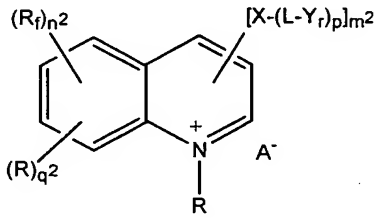
Structure (P-2)



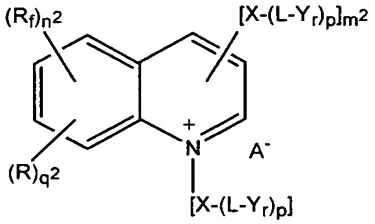
Structure (P-3)



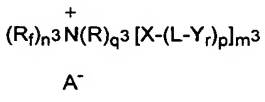
Structure (Q-1)



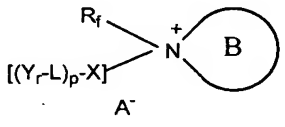
Structure (Q-2)



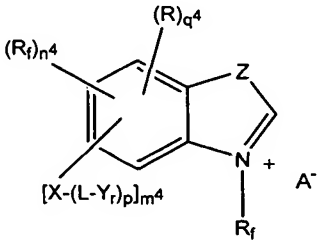
Structure (Q-3)



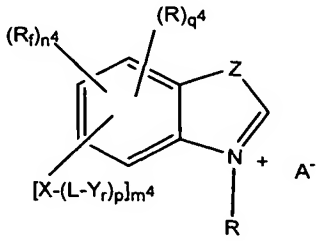
Structure (A-1)



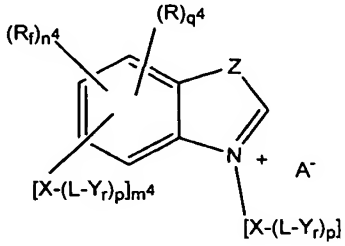
Structure (A-2)



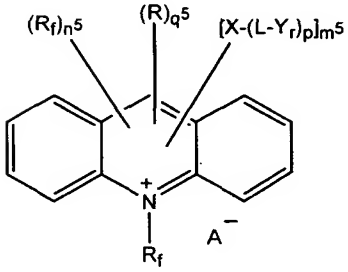
Structure (A-3)



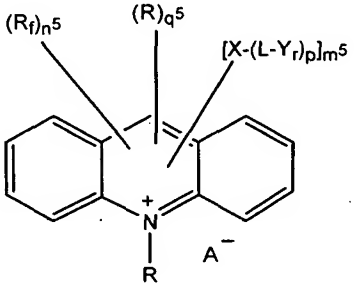
Structure (A-4)



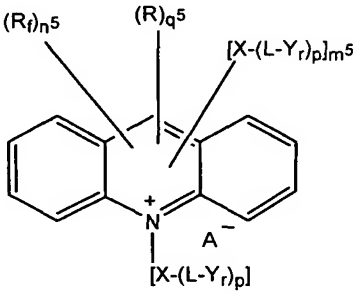
Structure (A-5)



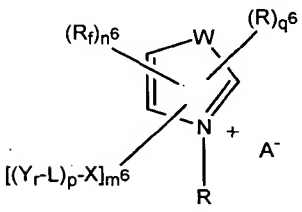
Structure (A-6)



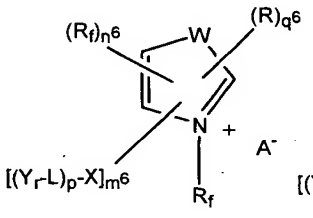
Structure (A-7)



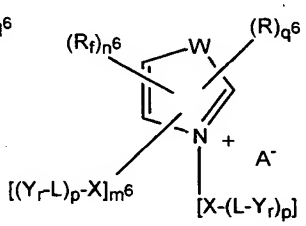
Structure (A-8)



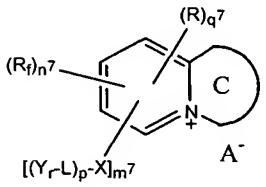
Structure (A-9)



Structure (A-10)



Structure (A-11)



Structure (A-12)

wherein:

A^- is a counterion,

R is chlorine, bromine, iodine, cyano, nitro or is alkyl, heteroalkyl, aryl or heteroaryl (each being optionally substituted); R^1O-, R^1S-, R^1R^2N-, R^1CO-, R^1OCO-, R^1COO-, R^1CONR^2-, R^1R^2NCO-, $R^1NHCONR^2$-, $R^1SO_2NR^2$-, $R^1R^2NSO_2$-, R^1SO-, R^1SO_2- in which R^1 and R^2 are

independently hydrogen or are independently alkyl, heteroalkyl, aryl or heteroaryl (each being optionally substituted);

R_f is fluorine, a fluorinated derivative of any one of alkyl, heteroalkyl, aryl or heteroaryl (each being optionally substituted) or a fluorinated oligomer or polymer; provided that R_f is not fluorine when R_f is bonded to nitrogen;

W is -S- or is $-NR^3-$ in which R^3 is hydrogen, alkyl, heteroalkyl, aryl or heteroaryl, (each being optionally substituted);

X is a linking group;

L is absent or a di-, tri- or tetra-valent linking chain;

Y is a reactive functional group;

Z is -O- or -S-, or is $-CR^4{}_2-$ or $-NR^4-$ in which each R^4 is independently hydrogen, alkyl, heteroalkyl, aryl or heteroaryl, (each being optionally substituted);

r is 1-3;

p is 1-5;

m^1, n^1 and q^1 are independently integers from 0-5, and $m^1+n^1+q^1\leq 5$;

m^2, n^2, and q^2 are independently integers from 0-7 and $m^2+n^2+q^2\leq 7$;

m^3, n^3, and q^3 are independently integers from 0-4, and $m^3+n^3+q^3=4$;

m^4, n^4, and q^4 are independently integers from 0-5, and $m^4+n^4+q^4\leq 5$;

m^5, n^5, and q^5 are independently integers from 0-9, and $m^5+n^5+q^5\leq 9$;

m^6, n^6, and q^6 are independently integers from 0-3, and $m^6+n^6+q^6\leq 3$;

m^7, n^7, and q^7 are independently integers from 0-6, and $m^7+n^7+q^7\leq 6$;

the ring B is a saturated or unsaturated (but not aromatically unsaturated) monocyclic or fused bi- or tricyclic ring having 4-13 ring atoms, optionally comprising one or two ring heteroatoms selected from the group consisting of O, S and NR* (where R* is as defined earlier), such that structure A-2 is an optionally substituted pyrrolidinium, piperidinium or morpholinium salt; and

the ring C is an aromatic monocyclic or fused bi- or tricyclic ring having 4-12 ring atoms, optionally comprising 1-4 ring heteroatoms selected from the group consisting of O, S and NR* (where R* is as defined earlier), such that structure A-12 is an optionally substituted quinolizinylium salt,

provided that the fluorinated quaternary nitrogen salt comprises at least 10% by weight of fluorine.

4. The method of Claim 3 wherein said counterion is an inorganic anion, an optionally fluorinated alkyl-, heteroalkyl-, aryl-, and heteroaryl-carboxylate and -sulfonate

anion, a R_f-substituted-carboxylate and -sulfonate anions (wherein R_f is as defined above) or an anion of optionally fluorinated di(alkylsulfonyl)imide.

5. The method of Claim 4 wherein said inorganic anion is F^-, Cl^-, Br^-, I^-, NO_3^-, NO_2^-, MnO_4^-, PF_6^-, AsF_6^- and SbF_6^- or a borate ion (such as tetrafluoroborate or tetra-phenyl borate wherein phenyl is optionally substituted with fluorine, an alkyl or fluoroalkyl).

6. The method of Claim 4 wherein said optionally fluorinated alkylcarboxylate anion is $C_aH_bF_{(2a+1-b)}CO_2^-$ wherein a is 1-30 and b is determined based on the fluorine content.

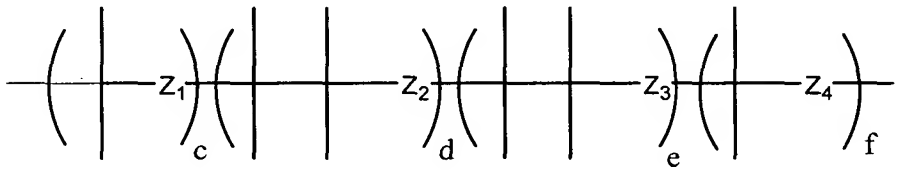
7. The method of Claim 4 wherein said optionally fluorinated alkylsulfonate anion is $C_aH_bF_{(2a+1-b)}SO_3^-$ wherein a is 1-30 and b is determined based on the fluorine content.

8. The method of Claim 4 wherein said optionally fluorinated arylcarboxylate or -sulfonate anion is $C_aH_bF_{(2a-7-b)}CO_2^-$ or $C_aH_bF_{(2a-7-b)}SO_3^-$ wherein a is 6-30 and b is determined based on the fluorine content.

9. The method of Claim 4 wherein said optionally fluorinated arylcarboxylate or -sulfonate anion is $C_aH_bF_{(2a-13-b)}CO_2^-$ or $C_aH_bF_{(2a-13-b)}SO_3^-$ wherein a is 10-30 and b is determined based on the fluorine content.

10. The method of Claim 4 wherein said anion of optionally fluorinated di(alkylsulfonyl)imide is $[C_aH_bF_{(2a+1-b)}SO_2]_2N^-$ wherein a is 1-30 and b is determined based on the fluorine content.

11. The method of Claim 4 wherein the R_f in the R_f-substituted-carboxylate or -sulfonate anion is represented by the following formula:



(A)

wherein:

the open positions (not designated) may be substituted independently by hydrogen, halogen (especially fluorine), alkyl, aryl, alkylaryl, arylalkyl, fluoroalkyl, fluoroaryl, fluoroalkylaryl, alkylfluoroaryl, fluoroarylalkyl, arylfluoroalkyl, $—OR^5$, $—OC(O)R^6$, $—C(O)OR^5$, $—C(O)NR^5R^6$

(wherein R^5 and R^6 are independently hydrogen, halogen (especially fluorine), alkyl, aryl, alkylaryl, arylalkyl, fluoroalkyl, fluoroaryl, fluoroalkylaryl, alkylfluoroaryl, fluoroarylalkyl, arylfluoroalkyl or a fluorinated polyether) and substituted derivatives thereof;
c, d, e and f may be independently 0-20; and
Z_1, Z_2, Z_3 and Z_4 are independently oxygen or absent.

12. The method of Claim 11 wherein said open positions are independently substituted fluorine or a fluorinated alkyl.

13. The method of Claim 12 wherein said fluorinated alkyl is a fluorinated methyl.

14. The method of Claim 11 wherein said R_f- substituted carboxylates and -sulfonates are $F(C_3F_6O)_dCF(CF_3)CO_2^-$, $F(C_3F_6O)_dCF_2CF_2CO_2^-$, $CF_3O(C_2F_4O)_dCF_2CO_2^-$, $F(C_2F_4O)_dCF_2CO_2^-$, $F(C_3F_6O)_dCF(CF_3)SO_3^-$, $F(C_3F_6O)_dCF_2CF_2SO_3^-$, $CF_3O(C_2F_4O)_dCF_2SO_3^-$ or $F(C_2F_4O)_dCF_2SO_3^-$ wherein d is 1-20.

15. The method of Claim 3 wherein X is alkylene, heteroalkylene, arylene, heteroarylene, oxyalkylene, oxyarylene, $-(OCHR^7CHR^8)_g-$, $-(CHR^7CHR^8O)_g-$, -CO-, -C(O)O-, -OC(O)-, $-C(O)NR^7-$, -C(O)N<, -C(O)NH-, $-NR^7-$, -N=, $-NR^7C(O)-$ in which R^7 and R^8 are independently hydrogen, alkyl, heteroalkyl, aryl or heteroaryl, (each being optionally substituted) and g is 1-300.

16. The method of Claim 3 wherein L is absent or a linking chain comprising one or more of the following moieties, connected together but not in any particular order: alkylene, heteralkylene, arylene, heteroarylene, polyether, fluoropolyether or a linking moiety.

17. The method of Claim 3 wherein L is a linking chain comprising one or more of the following moieties, connected together but not in any particular order: alkylene, heteroalkylene, arylene, heteroarylene, polyether, fluoropolyether, —O—, —HN—, >N—, —S—, —CO—, —C(O)O—, —O(O)C—, —NHC(O)—, >NC(O)—, —NHC(O)O—, —OC(O)NH—, —C(O)NH—, —C(S)NH—, —NHC(O)NH—, —NHC(S)NH—, —SC(O)NH— and —NHC(O)S—.

18. The method of Claim 3 wherein Y is HO—, HS—, H_2N—, NCO—, NCS—, HO(O)C—, epoxy, aziridinyl, carbodiimide, a short chain alkoxysilyl, a carboxylic acid

derivative, chloroformate, vinyl or other functional groups capable of undergoing polymerization or crosslinking.

19. The method of Claim 18 wherein said vinyl is $-CH=CH_2$, $-OCH=CH_2$, $-OCOCH=CH_2$, $-OCOC(CH_3)=CH_2$, $-OOCCH=CHCOOH$ or $-(C_6H_4)-CH=CH_2$.

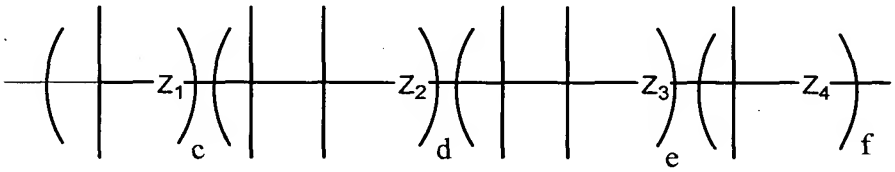
20. The method of Claim 3 wherein said fluorinated quaternary nitrogen salts are represented by P-1 and A-1.

21. The method of Claim 3 wherein said counterion, A^-, is an optionally fluorinated alkyl- or aryl-carboxylate and -sulfonate anion or a R_f-substituted-carboxylate or -sulfonate anion.

22. The method of Claim 3 wherein m^1-m^7 is 1 and p and r are independently 1 or 2.

23. The method of Claim 3 wherein R is an alkyl.

24. The method of Claim 3 wherein R_f is preferably a fluorinated alkyl or a fluorinated oligomer or polymer of the following formula:



(A)

wherein:

the open positions (not designated) may be substituted independently by hydrogen, halogen (especially fluorine), alkyl, aryl, alkylaryl, arylalkyl, fluoroalkyl, fluoroaryl, fluoroalkylaryl, alkylfluoroaryl, fluoroarylalkyl, arylfluoroalkyl, —OR^5, —$OC(O)R^6$, —$C(O)OR^5$, —$C(O)NR^5R^6$ (wherein R^5 and R^6 are independently hydrogen, halogen (especially fluorine), alkyl, aryl, alkylaryl, arylalkyl, fluoroalkyl, fluoroaryl, fluoroalkylaryl, alkylfluoroaryl, fluoroarylalkyl, arylfluoroalkyl or a fluorinated polyether) and substituted derivatives thereof;

c, d, e and f may be independently 0-20; and

Z_1, Z_2, Z_3 and Z_4 are independently oxygen or absent.

25. The method of Claim 3 wherein X is an alkylene chain and L is absent.

26. The method of Claim 25 wherein Y is preferably HO— or H_2N—.

27. The method of Claim 3 wherein X is —C(O)N< or —C(O)NH— and L is an alkylene chain.

28. The method of Claim 27 wherein Y is HO— or H_2N—.

29. The method of Claim 3 wherein X is an alkylene chain, L is a linking chain comprising one or more of the following, connected together but not in any particular order: alkylene(s), >N-, -O-, -OC(O)NH-, -NHC(O)-, -(O)CNH-, -NHC(O)NH-, polyether or fluoropolyether and Y is HO—, H_2N— or –$OCOC(CH_3)=CH_2$.

30. The method of Claim 29 wherein L is a linking chain comprising one or more of the following, connected together but not in any particular order: alkylene(s), -OC(O)NH-, -NHC(O)NH- and polyether and Y is -NH_2.

31. The method of Claim 29 wherein L is a linking chain comprising one or more of the following, connected together but not in any particular order: alkylene(s), >N-, -OC(O)NH- and -NHC(O)NH- and Y is –NH_2.

32. The method of Claim 29 wherein L is a linking chain comprising one or more of the following, connected together but not in any particular order: alkylene(s) and -OC(O)NH- and Y is –$OCOC(CH_3)=CH_2$.

33. The method of Claim 29 wherein L is a linking chain comprising one or more of the following, connected together but not in any particular order: alkylene(s), >N-, -NHC(O)-, -C(O)NH- and fluoropolyether and Y is –NH_2.

34. The method of Claim 3 wherein X is –C(O)N< or –C(O)NH-, L is a linking chain comprising one or more of the following, connected together but not in any particular order: alkylene(s), >N-, -O-, -OC(O)NH-, -NHC(O)-, -(O)CNH-, -NHC(O)NH-, polyether or fluoropolyether and Y is HO—, H_2N— or –$OCOC(CH_3)=CH_2$.

35. The method of Claim 34 wherein L is a linking chain comprising one or more of the following, connected together but not in any particular order: alkylene(s), -OC(O)NH-, -NHC(O)NH- and polyether and Y is -NH_2.

36. The method of Claim 34 wherein L is a linking chain comprising one or more of the following, connected together but not in any particular order: alkylene(s), >N-, -OC(O)NH- and -NHC(O)NH- and Y is $-NH_2$.

37. The method of Claim 34 wherein L is a linking chain comprising one or more of the following, connected together but not in any particular order: alkylene(s) and -OC(O)NH- and Y is $-OCOC(CH_3)=CH_2$.

38. A process for the preparation of electrophoretic microparticles, which process comprises:

(a) preparing a solution comprising a polymer precursor ("precursor/internal phase" or phase "I");

(b) emulsifying the precursor/internal phase into a fluorinated solvent or solvent mixture ("continuous phase" or phase "F"); and

(c) forming electrophoretic microparticles by hardening the emulsion, in which a fluorinated quaternary nitrogen salt is present in phase "I", phase "F" or both phases "I" and "F".

39. The process of Claim 38 further comprising dispersing a pigment, in the form of particles, into the precursor/internal phase.

40. The process of Claim 38 wherein said fluorinated quaternary nitrogen salt is a fluorinated pyridinium, quinolinium, ammonium, acridinium, azolium salt or a fused ring derivative thereof.

41. The process of Claim 38 wherein said fluorinated quaternary nitrogen salt is present in the amount of about 0.1% to about 20% by weight, based on the total weight of the electrophoretic microparticles.

42. The process of Claim 38 wherein said fluorinated quaternary nitrogen salt is present in the amount of about 0.2% to about 10% by weight, based on the total weight of the electrophoretic microparticles.

43. The process of Claim 38 further comprising adding a protective colloid in the continuous phase.

44. The process of Claim 38 further comprising adding a second charge controlling agent soluble or dispersible in the continuous phase.

45. The process of Claim 38 further comprising adding a second charge controlling agent in the precursor/internal phase or phase "I".

46. The process of Claim 38 further comprising adding a second monomer, chain extender or oligomer in the precursor/internal phase or phase "I".

47. The process of Claim 38 wherein step (b) is a direct or inverse emulsification process.

48. The process of Claim 38 wherein said precursor/internal phase further comprises a fugitive diluent.

49. The process of Claim 48 wherein said fugitive solvent is a solvent having a boiling point lower than 160°C.

50. The process of Claim 49 wherein said fugitive solvent is selected from the group consisting of acetone, ether, methyl ethyl ketone (MEK), methyl propyl ketone, methyl butyl ketone, cyclohexanone, ethyl acetate, propyl acetate, methylene chloride, tetrahydrofuran, toluene and xylene.

51. An electrophoretic dispersion which comprises electrophoretic microparticles comprising a fluorinated quaternary nitrogen salt.

52. The electrophoretic dispersion of Claim 51 wherein said fluorinated quaternary nitrogen salt is a fluorinated pyridinium, quinolinium, ammonium, acridinium, azolium or a fused ring derivative thereof.

53. An electrophoretic display comprising:

(a) a top layer and a bottom layer, at least one of which is transparent,

(b) an array of cells sandwiched between the two layers and display cells which are filled with an electrophoretic dispersion comprising electrophoretic microparticles which comprises a fluorinated quaternary nitrogen salt.

54. The electrophoretic display of Claim 53 wherein said electrophoretic microparticles are pigment-containing microparticles.

55. The electrophoretic display of Claim 53 wherein said fluorinated quaternary nitrogen salt is a fluorinated pyridinium, quinolinium, ammonium, acridinium, azolium or a fused ring derivative thereof.

56. The electrophoretic display of Claim 53 wherein said cells are prepared by the microcup technology.

57. The electrophoretic display of Claim 53 wherein said cells are prepared by the microprism or microgroove technology.

58. The electrophoretic display of Claim 53 wherein said cells are prepared by the encapsulation technology.

59. The electrophoretic display of Claim 53 which is driven by the traditional up/down switching mode, the in-plane switching mode, the total internal reflection switching mode or the dual switching mode.

60. Use of a fluorinated quaternary nitrogen salt for improving the yield, particle size and size distribution and the performance of an electrophoretic display.

61. Use of Claim 60 wherein said fluorinated quaternary nitrogen salt is a fluorinated pyridinium, quinolinium, ammonium, acridinium, azolium or a fused ring derivative thereof.